

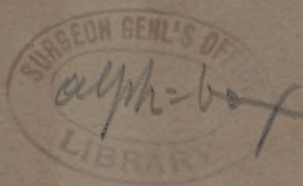
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# Fibrinous Bronchial Casts.

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# AN INQUIRY

RELATIVE TO THE SUBJECT OF THE

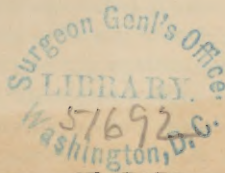
FORMATION AND EXPECTORATION

OF

## FIBRINOUS BRONCHIAL CASTS,

ACCOMPANIED BY THE HISTORY OF AN ILLUSTRATIVE CASE.

Contributed to the Transactions of the N. Y. County M. S. by STEPHEN  
ROGERS, M. D., Professor of Physiology and Microscopic Anatomy  
in the New York Medical College; Surgeon to the Demilt  
Dispensary; late Surgeon to the Panama Railroad Co.,  
and the 7th regiment N. G. S. N. Y., &c., &c.



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## AN INQUIRY

RELATIVE TO THE SUBJECT OF THE

Formation and Expectoration of Fibrinous  
Bronchial Casts.

Bronchial fibrinous exudation; acute or chronic plastic bronchitis, are names given to pathological conditions, and results, in the smaller distributions of the air passages, even to the air vesicles; analogous to those conditions known by the names of *diphtherite*, *angina membranacea*, and *croup*; affections limited for the most part to the fauces and larynx; but which often extend downward through the trachea to the terminal portions of the bronchial tubes. While this extension downward is so frequently true of croupal disease, plastic bronchitis, on the contrary, is remarkable for its never extending upward to anything like an equal degree. Whatever its causes may be, therefore, it would seem that they are more or less strictly confined to the parts including the smaller branches of the bronchial tree. The recognized causes of exudative bronchial inflammation, such as we are now engaged with, constitute a subject upon which as little has been written as upon almost any subject in medicine. After a somewhat extended and careful research among all the accessible records of this disease, the evidence therein afforded does not leave me with a doubt that one, if not the most *frequent* cause of exudative bronchial inflammation, accompanied or not by the expectoration of fibrinous casts, is that disease known as *fibro-bronchitis*. Dr. Thomas H. Buckler, one of the earliest and the fullest writer upon *fibro-bronchitis* of whom I have any knowledge, defines this disease as an inflammation seated in the fibro-cartilaginous tissue of the bronchial tubes, or in the tubes proper, and not in their investing mucous membrane, which is ordinary bronchial catarrh; and to make more clear this distinction, refers to the anatomical fact that the bronchial tubes are composed of mucous membrane, fibro-cartilaginous rings, with filaments of muscle, and areola tissue and vessels.

We however should be careful not to fall into the error of supposing that inflammation of this tissue is necessarily attended by an exudation of formed fibrin, and still less that such exudations should always be expelled by coughing. On the contrary, it would seem to be comparatively rare, for Dr. Buckler mentions but a single case in all his record.

Dr. Peaslee, in his paper on croup, published in 1854, remarks that "all analogy favors the presumption that laryngitis may run through its course and terminate favorably in the infant as well as the adult, without necessitating the formation of a false membrane in any degree. Inflammations of even the serous membranes are not uniformly productive of false membranes, in either infants or adults; indeed, they are so only in a minority of all the cases."



But it is important to know that a symptom which was marked in all of his cases, and which he esteems as almost diagnostic, was a very *albuminous* sputa, the nearest allied to fibrin, of all animal substances. Now if we can, by comparison, show that two cases of disease are apparently alike in every particular, except that in one, formed fibrin was expectorated, and in the other not, the inference appears to me fair and legitimate that pathological conditions may be identical in both; that, for example, inflammation of the fibro-cartilaginous tissues of the bronchial tubes exists in both, but that, by some unknown means, the fibrin is formed in the one case, and not in the other.

The first case I will take from Dr. Buckler is that of a lady about thirty years of age, who was attacked on the 6th of February with a prolonged chilliness, followed by the usual phenomena of inflammatory fever, a constant hard and dry cough; while auscultation for some days discovered nothing except a faint, isolated and occasional sibilant râle, over the dorsal surface of the two lungs. On the 14th of the same month, and for several weeks after, a rattle, variable in character, size, abundance and humidity, could be uniformly heard on the right side, over a diameter of about two inches, the center of which was about an inch and a half below the superior angle of the scapula. At this point the most careful comparison with the opposite side could detect no dullness at any time. Every other part of both lungs seemed perfectly healthy, except the continuance of the occasional sibilant râle over the dorsal regions above mentioned. The cough was generally dry and unproductive, except that now and then a small quantity of extremely viscid mucus was voided, mingled with a highly *albuminoid* serum. A few days after re-established health, this patient suffered a similar attack, in all respects, except that the subcrepitan râle were removed to the posterior portion of the summit of the lung, where, over a space of nearly three inches in diameter, they were distinctly heard, as were also coarse crepitations. A detailed account of the treatment of this case is given, as well as accompanying and collateral history, all of which carries irresistible conviction that it was a case of the character diagnosticated by the author, to wit: inflammation of the fibro-cartilaginous tissue of the ultimate ramifications of the bronchial tubes in the localities designated, and that it was of a *rheumatic* nature.

In 1860, Dr. Salter presented specimens of fibrinous bronchial casts, expectorated by a person under his observation, and made the following report to the London Pathological Society: "After some exposure and taking cold, the patient, a stout man of 33 years of age, suffered the usual fever and cough of a bronchial catarrh in its acute stage, excepting that the cough from the first was remarkably dry, with occasional scanty viscid sputa. Not many days from the commencement of the attack, the casts above mentioned first appeared in the expectoration, generally accompanying this viscid sputa. These casts were expelled at varying intervals of a day, to two or three days, for a period of about two months, when all cough disappeared. About three months later, this patient suffered a similar attack, with a dry and tearing cough generally, but now and then in paroxysms lasting two or three hours, relieved by the expulsion of one or more casts. This attack continued for nearly three months, and then passed off. The

chest was found everywhere resonant, range of movement great, and air entering everywhere. There was no morbid sound of any kind, except in one spot about two inches to the right of, and below the right nipple, where, over a space of about the size of a shilling, was clear and well developed pneumonic crepitation. The crepitation was confined to the end of inspiration, was long and distinct in proportion to the inspiration, and was of the true fine pneumonic type." Eighteen months after this examination, made during and near the close of this attack, this patient was carefully auscultated, and the same physical signs were found in the same spot, but over a slightly enlarged area. His general health had been unimpaired all this time, though to the best of his recollection, he had not passed three consecutive days since the last examination, without coughing up at least one cast. Six months later, and about two years after this record begins, this patient was examined, and the area over which the crepitation could be heard, was slightly more extended, being now about two inches in diameter, but all the other conditions remained the same as before. This patient never spat any blood. Only two features in this case, differ from that of Dr. Buckler's, viz; this one lasted longer, and bronchial casts were expectorated. It was simply the chronic form of Dr. Buckler's disease. But a few years before, Dr. Bristowe presented a report to the London Pathological Society, of some cases of pulmonary disease, which, I think, must be regarded as the acute form of the disease. Of his first case, he states that the patient was sick nine days; had during that time troublesome *cough without* expectoration; there was dullness over the affected portions of the lungs, but no crepitation when he examined her, which was the day before death. There was also egophny, and increased vocal resonance. "At the autopsy, the dull parts of the lung were found solid, and the bronchial tubes leading to these parts, were found filled with fibrinous casts, extending from the main branches to the terminal ramifications." In the same paper, this author gives the history of three other cases similar to this one, in respect to the co-existence of pneumonia, and fibrinous casts filling the bronchial tubes leading to the affected part, which was in all the cases, more or less narrowly circumscribed. It is worthy of remark, that in this first case of Dr. Bristowe's, no early examination of the chest was made, and, therefore, how much the physical signs in the early stage may have resembled those in Dr. Salter's chronic case, is not known, but they were probably very similar. Dr. Buckler fully comprehended the relation which cases of pneumonia like these of Dr. Bristowe's bear, to fibro-bronchitis, and to plastic exudation into the tubes supplying the inflamed portion, as I infer from the following paragraph, taken from the work already mentioned. He says, "fibro-bronchitis is often the most insidious disease. It may last in a sub-acute form for days, weeks or months, with no other annoyance than producing a *dry cough*; but is liable, by exposure to dampness, or some other trivial causes, to be at any time suddenly converted into an *acute* bronchitis of similar character. On this, pneumonia frequently supervenes, giving rise to one of the most dangerous complications. But still more frequently, acute bronchitis with contemporaneous or subsequent engorgement, happens suddenly, without being announced by cough." Of Dr. Buckler's 27 cases of fibro-bronchitis, pneu-



monia complicated 12. "Seven of these had a limited engorgement, being confined to a few lobules, and not exceeding in any instance, three inches in diameter. In the other five cases, the engorgement was largely diffused throughout one or more lobes. In only eight of these cases was the pneumonia recognized both by auscultation and the signs furnished by the sputa. In two, the ear detected the engorgement, the other signs failing; in one, the sputa were rusty when other signs failed to show vascular lesion." He states that the most prominent symptoms of fibro-bronchitis are, "a constant or a paroxysmal unproductive cough, sensation of soreness under the sternum, and copious sweating, with a pulse and respiration not unusually frequent, except during the paroxysms of cough. With the exception of an occasional sibilant rale, the auscultatory signs are entirely negative. When, however, pneumonia sets in, it becomes a most important sign of the pre-existence of bronchitis, since it can generally be recognized either by the sputa furnished, or by the ear; and thus, indirectly only, auscultation becomes an important mode of determining the present disease." Dr. Buckler states the point I desire to elucidate by these quotations in these words: "Fibrous bronchitis serves also to explain the formation of the plugs, or concretions of amorphous semi-organized matters, which occasionally blocking up the bronchial tubes, are sometimes, though rarely, expectorated in cylindrical or columniform masses." However, only one of his 27 cases reported, expectorated any such mass. This occurred in the sixth or seventh week of the disease, and is described in these words: "This morning, after a violent and long continued paroxysm of cough, in which the nurse says he nearly strangled, he got up a plug of concrete mucus and albumen, covered on its outer surface with what seemed to be semi-organized plastic lymph. It was about an inch and a half in length, bore the appearance of having been retained for a long time, and must have been moulded in one of the primitive bronchi." Dr. Buckler's memoir was written, to prove that by far the most general cause of idiopathic fibro-bronchitis is of rheumatic origin, that it is in fact, a rheumatic inflammation. The clinical histories that he adduces in support of his proposition, certainly afford convincing evidence of its truthfulness. That rheumatism is often complicated with lung inflammation, is no new thing, but the localization of its seat in such cases, to the fibro-cartilaginous tissues of the bronchial tubes, is, so far as I know, original with this author. Fuller, on rheumatism, remarks: "Another complication which adds greatly to the danger attendant upon this disease, is inflammation of the lungs, and their membranous coverings; inflammation attacking sometimes one, and sometimes another part of the pulmonary structure, sometimes invading all parts simultaneously, producing dyspnoea, suffocation and death. In some instances the pulmonary inflammation may be excited by simple contiguity of the affected structure—alluding to the heart and pericardium—but more generally whether the attack be bronchitis or pneumonia, or whether it assumes the form of pleurisy, it is due to the same cause of irritation, the same morbid agent which excites the articular or the cardiac affection." He also states "that as inflammation, when affecting the lungs, very rarely spreads to the pericardium, so inflammation of the investing membrane, has very little tendency to spread, either to the endocardi-



um or to the lungs, and that when such an action is set up in either or both of such parts coincidentally with, or during the progress of pericarditis, it is usually caused by the same agency which induced the original attack of inflammation." More than twenty years ago, Dr. John Taylor stated in an elaborate paper read before the Medico-Chirurgical Society of London, upon the subject of pericarditis as related to rheumatism and Bright's disease, "that in rheumatism, both acute and chronic, especially the former, there is a great proneness to inflammation of various internal parts, especially the lungs and pleura." Dr. Latham, who recorded his experience prior to Dr. Taylor's paper, states that in his practice, one in every nine cases of rheumatic disease, had complications of lung inflammation. But where pericarditis existed, one in every two had lung trouble, and in both endo, and pericarditis, two-thirds of them had lung complication. He states that in an observation of 136 cases of acute rheumatism, one in every five and a half had more or less severe broncho-pneumonia. Dr. Taylor states in his paper, that in an observation of 47 cases of sub-acute rheumatism, "about one-fourth had bronchitis, generally trifling in amount, more or less chronic, having often existed previously." In another series of cases, one in five had more or less acute broncho-pneumonia; and in still another series, one in seventeen cases. Dr. Taylor mentions among his cases of pericarditis, a case of pneumonia, in all probability similar to Dr. Bristowe's cases. Pleurisy appeared before the pericarditis; there was pneumonia in the upper lobes of both lungs, or at least there was some disease solidifying these upper lobes, especially the right one, before the pericarditis appeared, but no positive signs of pneumonia existed till after the seizure of the heart. It is much to be regretted that no examination of the parts was had after death in this case, and also that no account is given of any rheumatic tendency, or rheumatic disease in any of Dr. Bristowe's cases, as this would have unquestionably completed the chain of evidence that rheumatic broncho-pneumonia is often a true *rheumatic fibro-broncho-pneumonia*. I entertain little doubt that this case of Taylor's was similar to those of Bristowe, and that it was a case of fibro-bronchitis and pneumonia of rheumatic character; and that it is as common a cause of the plastic exudation into the cavities of the tubes, as it is of plastic exudation upon the serous membranes about the heart and lungs. I find a case of interest in this connection reported to the Pathological Society of this city, in January, 1849, by Dr. Metcalf. The case was diagnosticated as acute phthisis, with dullness in the upper portion of both lungs. At the autopsy the heart was found hypertrophied, the aortic valves were found with patches of fibrinous deposit, and one of them perforated by ulceration. The pulmonary valves were also the seat of fibrinous deposit, and upon the mitral valves the same process of formation of effused fibrin was going on. But no tubercles were found. The dull portions of lung were in the second and third stages of pneumonia. The patient was about 28 years of age, and had been sick, with more or less severe cough and sweating, for six weeks. To me, the probabilities that this was a case of rheumatic pneumonia and endo-carditis, are very great. Between the cases of fibro-bronchitis, wherein the effused fibrin is formed, and those in which it is expectorated in fluid state, there is of course a marked difference of phe-

nomena. The presence, more or less suddenly, of a solid cast in a portion of the bronchial tubes supplying a lung, adds dyspnœa of more or less urgency to all the antecedent symptoms. That occurred in Dr. Salter's case in a marked degree. Though he had cough for so many years, his health remained good, except on occasions of taking cold, which he was extremely liable to, when he would suffer more or less violent fits of dyspnœa, followed by expectoration of casts. Dr. Metcalf reported to the New York Pathological Society, in January, 1856, a case of what he thought might be termed fibro-bronchitis, of four or five years standing, in which after an attack of sudden and unusual dyspnœa and cough, the patient had about that time coughed up her first and only bronchial cast, which was presented to the Society.

Dr. Crisp, of London, reported the history of a case in 1856, in which during a period of six or seven years that the patient had been under observation, and had suffered constant cough, the expectoration of fibrinous casts, was an *occasional* symptom only. It is therefore not strange that the cases of rheumatic broncho-pneumonia, reported by Dr. Buckler, and the greater portion of the cases of fibro-bronchitis, reported by other authors, should have been attended by only a part (the greater part it is true), of the symptoms, characterizing those cases in which the effused lymph formed into casts of, and either was expectorated from the bronchial tubes, or was found occupying them after death. He states that "fibro-bronchitis, degenerating into a chronic disease, may last for months or even years; the cough is dry, or the matter expectorated is a highly albuminous serum." The clinical history of his cases exhibits a remarkable correspondence of phenomena between them and the recorded cases of expectoration of bronchial casts. Though the minutiae of pathological detail he presents by no means equal that given by Dr. Bristowe, of his cases of pneumonia with plugging of the bronchial tubes supplying the diseased part, any one who will carefully read the accounts given by both, must be convinced of what I believe to be the fact, that Dr. Bristowe has simply enlarged and followed up the history of the same disease, whose study was commenced by Dr. Buckler. Still further in support of the opinion of the original identity of *fibro-bronchitis*, *Dr. Bristowe's pneumonia*, and very many of the cases of *expectoration of bronchial casts*, is the fact, that so many of the former and the latter class have been highly sensitive to the causes known to affect rheumatic disease. Dr. Salter's remarkable case of chronic expectoration of casts was obliged to be as careful to avoid exposure to cold and dampness, as the most sensitive rheumatic, else he was sure to pay the penalty, by a sudden accession of cough, more or less constant, and finally relieved by the expectoration of the fibrinous casts.

Dr. Fuller also related a case to the London Pathological Society in 1853, wherein, while the patient remained in a warm air, no dyspnœa or cough occurred; but exposure to cold and dampness, was almost sure to bring on a cough, lasting incessantly for two or three days, and terminating with the expectoration of these bronchial casts.

Dr. Buckler says that some of the characteristic signs of fibro-bronchitis are inordinate sensibility to cold, paroxysmal or constant cough of unpro-

ductive character, and profuse sweatings, and not unfrequently more or less febrile action.

Now, Dr. Peacock, who reported upon the subject of expectoration of bronchial casts, to the London Pathological Society, in the most elaborate manner, more than ten years ago, says that the symptoms by which the cases reported have been generally attended or preceded were those of sub-acute bronchitis, a cough extremely hard and dry, and slight febrile symptoms. He omits only the additional symptom of Dr. Buckler, viz, the sweating. A not unimportant additional evidence of the supposed rheumatic character of this disease is the correspondence of age and sex of its subjects, and those suffering rheumatism. Dr. Buckler's cases were in large majority adult males, as were also Dr. Bristowe's. Dr. Peacock, in his report on expectoration of bronchial casts, gives one series of 34 cases, of whom 25 were males, mostly adults, and nine females. In another series of ten cases, eight were males and mostly adults.

Now, Fuller, on rheumatism, remarks—what nearly everybody knows—that “it is well understood that rheumatism is a disease of adult age; that very few cases occur before the age of fifteen, and comparatively few after the age of fifty.” His tables make it appear that in his cases about two cases occurred in males to one in females. It appears then to me hardly questionable that rheumatic inflammation is a frequent cause of plastic exudation into the bronchial tubes, and that its most probable seat is the fibro-cartilaginous tissues of those tubes.

To continue still further, the comparison of the symptoms of fibro-bronchitis, as stated by Dr. Buckler, and those attending the cases of expectoration of bronchial casts, I will here reintroduce Dr. Peacock's description of the latter disease. I have before stated that he enumerates as signs of subacute bronchitis, dry and hard cough, slight febrile symptoms; but in addition he enumerates “sibilant sonores, mucus or subcrepitant rhoncus, with or without impairment of the natural resonance on percussion, and occasionally without the respiratory sounds in the parts affected.” Sooner or later dyspnoea comes on, and at length becomes urgent, so much so occasionally as to threaten suffocation, till suddenly, after a severe paroxysm of cough, one or more casts are expectorated, it is more or less perfectly relieved. These paroxysms may be repeated at intervals of hours, days, weeks, months, or even years. They may also be much varied in kind, degree and duration. For example, the cough is generally violent and paroxysmal; but it may be trivial, the casts being expelled with little effort. They are sometimes thrown out nearly dry, but at others more or less mingled with bronchial secretions, and more rarely still with blood.”

Tubercles are also a recognized cause of irritation and inflammation of these same tissues, and which may also result in the exudation and formation of lymph, and the production of bronchial casts. Though the histories of cases presenting this cause are very imperfect, they are sufficient to give rise to the suspicion that tubercles are the cause in most if not all the cases which are accompanied by hæmoptysis. I do not mean to include in this category those cases of sudden hæmoptysis, and a few days after an expectoration of casts of the bronchial tubes, composed of coagulated fibrin, more or less tinged with blood; but those cases wherein casts of



formed fibrin exuded in inflammation, have been expectorated for more or less time before the hæmoptysis takes place. Even in cases whose original and principal cause may have been rheumatic, and without any appearance of blood in the expectorated matter, it is possible for this seat of chronic inflammation to serve as a nidus for the deposit of tubercular matter, after which hæmoptysis may appear. D. Buckler's only case of expectoration of casts was one of this kind.

Another recognized cause of inflammation of the fibro-cartilaginous tissues of the bronchial tubes, is the presence of any abnormal growth immediately about the tubes, and exerting mechanical or other irritation upon them. Such growths may be malignant or benign in character. Of the former class, I have had a remarkable case under my observation during a part of the past year. It having directed my attention to the subject, and having therefore been the exciting cause of this paper, its history, it is presumed, will be sufficiently interesting to warrant its introduction here.

A married female, of about 30 years of age, began to suffer what she termed a "shortness of breath, without cough," early in the year 1864. She was at the time some months advanced in her second pregnancy, and was therefore not at first surprised at this dyspnœa, but it soon having increased so much as to alarm her, she sought medical advice for it about three or four months before her confinement. Her symptoms, as stated by herself, were at that time dyspnœa, so great as to nearly disable her for the discharge of her household duties, that any effort, such as going up stairs, augmented it to an alarming degree. Even under the strictest quietude her respiration was hurried. No means adopted procured any relief, and she went on suffering till her confinement, under the promise and the hope that that event would bring her relief. She was delivered in May, 1864, but the expected improvement in respiration was not realized. On the contrary, her dyspnœa grew. She therefore, as soon as practicable, consulted other physicians, and resorted to various public institutions, but with no marked beneficial result. About three months after her delivery, and over six months subsequent to the first appearance of the dyspnœa, she was seized with slight catarrhal symptoms—a slight cough, and a sub-sternal soreness. The cough rapidly increased, and soon became severe, was remarkably dry, often paroxysmal, and worse at night. About two weeks after the first appearance of the cough, during one of these paroxysms, she coughed up a substance, like one of these specimens, in a nearly dry condition. Her dyspnœa, which for several hours had been urgent, was at once very greatly relieved, and the cough for a time almost entirely disappeared; but they both returned in the course of a day or two, attended by the same phenomena, and were again as suddenly relieved by the expulsion of another fibrinous cast. These paroxysms recurred at various intervals, but as the patient and the attendants state, so often, that the number of casts expectorated would amount to from one to a half dozen daily, through a period of about three and a half months. They have always been expectorated with remarkably little fluid, and never with any blood. The many samples I have seen have always been collected in cups and tumblers, and presented an opaque, semi-fluid mass, composed of these casts, saliva, buc-

cal and bronchial mucus. Even in this state, the arborescent character of the casts was very distinct, but was brought out with extraordinary beauty by an admixture with and gentle agitation in water. They have always been cylindrical or solid, and have varied from one-eighth to three-eighths of an inch in diameter at the base of the cast, thence ramifying indefinitely, till the extreme length of some of the larger ones reached nearly four inches. The accompanying natural size engraving of one of these casts whose size and number of branches show it to have been formed in the bronchial tubes of an entire lobe of a lung, gives a very correct idea of its appearance and of the general form of most of them. They are fibrous in character, made up of concentric layers, and, as already stated, have uniformly been solid. After the second month of the period during which this patient expectorated these casts, I saw and examined her frequently, and noted the following signs: Respiration much hurried at rest, but increased to almost panting by a little muscular effort; appetite variable, though considering that she had, up to the third month of this expectoration, continued to nurse her child (a well grown one), the state of her nutrition could not be said to differ much from that of most nursing women; she suffered migratory pains of the limbs and joints, supposed to be neuralgic, and a substernal soreness, worse at night, extending right and left throughout the chest. Her chief complaint was of the more or less constant dyspnœa, and cough coming on in the paroxysms above described, though any effort at speaking induced short, tormenting cough; the deep cervical glands on the right side were considerably enlarged, so much as to give a marked fullness to that side of the neck, from the clavicle upward; some of the axillary glands on the same side were also enlarged, and some of the superficial lymphatic glands on the left side, all without tenderness. The patient was strikingly anemic, complained of feeling weak, though all the time at work, and the pulse was in no respect remarkable; percussion did not show any disease in any part of the chest, a perfectly healthy resonance being found throughout; the respiratory murmur was also found in all parts; some sibilant râle were heard over the anterior superior portion of both lungs; heart sounds normal. I never found this patient with fever, nor did I find any reason for supposing that she suffered fever of any amount day or night; nor did I ever happen to visit her during or immediately before a paroxysm of cough. There was no soreness of the fauces, nor signs of diphtheretic exudation. The patient afforded no evidence of tubercular predisposition. Weaning the child, and the use of bark and iron, seemed to improve her strength and color for a time; but the cough and expectoration of casts continued, as well as the dyspnœa, for about four weeks, when these signs suddenly terminated by a paroxysm of cough and dyspnœa of great severity, lasting more than an hour, expelling finally one of the largest casts she had ever produced, so large, indeed, that it came near suffocating her during its passage through the glottis. The relief from cough and dyspnœa, produced by this expulsion, was more perfect than on any former occasion, and continued for some weeks, leading her to hope that her disease was cured; but under the excitement of a slight catarrhal affection, the cough and dyspnœa both returned, though to a less degree; and the expectoration was a frothy mucus, with only an occasional tape,

like piece of formed fibrin. This, after a few weeks, entirely disappeared, the expectoration assumed a muco-purulent character, the dyspnoea continued to rather augment, the enlargement of the cervical glands gradually progressed, involving both sides, as well as both axillæ; the superficial veins of the front of the chest became large and prominent; the complexion again grew sallow; she began to emaciate; suffered hectic fever and wandering pains in the chest. Soon after the appearance of the muco-purulent expectoration, that material was repeatedly submitted to microscopic examination, and always found to contain cells, whose exuberance of nuclei and nucleoli, showed malignant activity of growth. This continued to be a marked characteristic of the sputa to the last. A few weeks before the death of this patient, Dr. Leaming, at my request, kindly examined the chest in a most thorough manner, and rendered the following report: "Broncho-respiratory sounds very much exaggerated on the right side from the clavicle to the third rib; prolonged in expiration near the sternum. Over this region were heard occasional sibilant sonore near the ear, and soft râle at a greater distance, and the pitch of respiratory sounds heard in this region was raised. Sounds of the heart accelerated and distinctly heard as high as the third rib under the middle of the right clavicle. The true respiratory sounds were feeble over all the anterior portion of lower lobe on this side. The broncho-respiratory sounds slightly exaggerated over the anterior superior portion of the left lung, but slightly prolonged in expiration, without sibilant sonore, and without râles. The posterior superior portion of this lung, afforded sounds like those in front, but a little less marked. Below the superior angle of the scapula, the sounds were much raised in pitch, rather increasing as the ear passed downward, till, below the eighth rib, all sounds were lost. The sounds on the right side, superior and posterior, were generally like those in front in the same side, excepting that near the spinal column, the broncho-respiratory sounds were greatly exaggerated, indeed almost tubular, much raised in pitch, the respiratory sounds feeble, prolonged in expiration, with occasional soft râle. In the region at and below the inferior angle of the scapula, the tubular character of the broncho-respiratory sounds disappeared, but it was still raised in pitch, and the respiratory sounds very feeble. Dullness on percussion up to the eighth rib posteriorly on both sides, and on the right side to a considerable distance from the spine, all the way up. The dullness extended all around the chest up to the level of the eighth rib. Resonance on percussion good, down to this level in both lungs" Dr. Leaming unhesitatingly gave it as his opinion, that the case was one of malignant disease, filling the posterior mediastinum, and involving the lungs. Though the muco-purulent sputa contained abundance of cancer cells, no such cells have ever been discovered in or upon the casts, though they have been sought for by different microscopists. At the time of death, the axillary glands were enormously enlarged, as well as the deep cervical. The patient died of apnoea, about the end of September, 1865, and though no autopsy was obtained, there would appear no doubt that the disease was malignant. I have found but one case whose history resembles this in its bearing upon the subject of pressure of malignant disease upon the bronchial tubes, as cause of plastic exudation. It occurs



in the final account of one of Dr. Peacock's cases of expectoration of bronchial casts. At the autopsy he says, "both lungs were found adhered firmly to the parietes of the chest. The left lung was voluminous; at the upper part were numerous cavities, and at the posterior inferior portion, was much solidified and contained collections of pus. In the anterior portion were several masses of whitish yellow deposits, resembling medullary sarcoma. The right lung less extensively diseased. A microscopic examination of this deposit showed it to resemble degenerating encephaloid substance more than anything else. The cells were much like those characteristic of myeloid." "There can be no doubt that this substance examined was similar to that expectorated by the patient and exhibited to the Society." This, as we see, is merely supposition on the part of Dr. Peacock, he not having taken the care to report, and perhaps not to even examine the contents of the air tubes at the autopsy; while in my case, repeated careful examination of the casts, failed to discover any evidence of malignancy about them, cancer cells not having appeared till later in the disease. Though it is stated that malignant growths may spring from the mucous membrane of the air passages, form into casts of those passages, and becoming detached, may be coughed up, I have found no record of a case wherein any such casts were examined and found to possess malignant characteristics. I therefore suspect, that the casts in Dr. Peacock's case, were *not* "similar" in character to the deposits found at the autopsy; but that they were formed fibrin, the results of inflammatory exudation caused by the pressure of malignant growth outside the tubes. That fibrinous effusion may take place upon the surface of the mucous membrane of the air passages, from disease seated in the deeper tissues, without destroying or even seriously disturbing the epithelial structure, is I believe, admitted by pathologists. This fact was demonstrated in Dr. Bristowe's cases of casts occupying the tubes leading to pneumonic lung. This author has gone into a long argument to establish the supposition that casts of the ultimate bronchial tubes, and even of the larger ones, may be formed out of coagulable material effused into the air cells, thence pushed out into the tubes, becoming more and more solid as it advances. In this manner he attempts to account for the fact that the epithelium under the casts was intact in his cases. But this effort appears to me unnecessary; if it be admitted that germinal matter, accumulated in and thrown out from all inflamed tissues, is readily transmitted by the epithelial cells overlying that tissue. Upon its arrival at the free surface it is thrown off as transmitted matter, mixed more or less with the peculiar elaboration of the cell, and becomes formed material, or remains in the fluid state, according to circumstances. May it not be that the circumstance determining this is the relative proportion of germinal matter and cell secretion thus mingled? A point of interest in the case I have recorded was the protracted dyspnoea before any cough supervened, and still longer before any casts were expectorated. Dr. Peacock states that this disease (expectoration of casts) may attack persons who enjoy robust health—Dr. Salter's case was an example—but it generally occurs in those who have previously suffered from some chronic pulmonary disease. No opinion is here ventured as to what the chronic pulmonary affection might be. But we have seen that it may be

a rheumatic inflammation, chronic or acute, of the fibro-cartilaginous tissues of the bronchial tubes, liable to manifest itself in other parts of the body; that it may be excited by the irritation of tubercles deposited in or upon this same tissue, liable to attacks of hæmoptysis, and to be accompanied by other signs of phthisis; that it may be malignant deposit, rendering the lungs inadequate to the duties required of them, and finally, by mechanical pressure, excites the inflammation and plastic exudation, liable to glandular enlargements and general signs of cancerous cachexia. The case I have recorded was an illustration of this form. Any substance, whether a malignant or benign growth, which may press upon any portion of the air tubes, is liable to excite an exudative inflammation, and the formation of casts.

Dr. Metcalf, of this city, reported to the Pathological Society, in 1853, a case wherein the person habitually expectorated pieces of fibrinous exudation, with much cough and obscure symptoms. After death an aortic aneurism was found pressing on the trachea. On a subsequent occasion he stated that further experience in this matter had led him to the opinion that it is a sign of value, and had been the only symptom that had led him to suspect aneurism in certain cases. He alluded to three recorded cases in which this sign led to a diagnosis of aneurismal pressure upon the trachea, and remarked that we must admit this as a cause of fibrinous exudation and expectoration; that in his belief the coexistence of cough, dyspnoea, and the expectoration of these pieces of fibrin, without the presence of lung signs sufficient to account for them, was not to be found in any other disease, and that they are tolerably frequent in aneurism pressing upon the trachea. I therefore accept these conditions as elements of a differential diagnosis for a fourth cause of fibrinous expectoration from the trachea and its ramifications. The pathological history of the case I have presented, I conceive to be, that the malignant deposits first appeared in and about the bronchial glands, extending along the tubes, and by the pressure of the accumulated material, more or less occluded these passages. Hence the early dyspnoea and sibilant sonore, but this pressure was not so great as to produce a complete shutting up of these passages at an early period of the disease, hence the resonance and constant presence of respiratory murmur. The advance of the disease at length involved the fibro-cartilaginous tissues of the bronchial tubes, and excited the exudative inflammation, and the fibrin formed into the casts, which by their irritation excited the cough and caused their expulsion. Still later, the mucous membrane was involved, and then the fibrin ceased to form, was expectorated in the fluid state, a muco-purulent fluid, loaded with deformed and enlarged ciliated epithelial cells, multinuclear, and large numbers of free nuclei floating about in its fluid. It will be remarked that, though the real disease steadily advanced, the symptoms were much mitigated at the time of the cessation of the formation of casts. The disappearance of these plugs of fibrin is quite sufficient to account for this change. But why it is, that nearly normal vesicular murmur should have been always present whenever she was examined, during a great part of the time these casts were being coughed up, I can only explain by supposing that the formation of them was very rapid, as it obviously was, and



therefore the period between the partial filling up of the bronchi, and their complete occupation by the casts, was short, and happened to occur between the examinations. There must have been a period of more or less duration, in which the air could not pass through the bronchial tubes occupied by these larger casts, to produce the vesicular murmur. The amount of material thus thrown off in this case must have been unusually great, judging from the specimens seen, known to have been preserved, and the patient's statement as to the quantity thrown away. I should estimate it at many ounces. It will be recollected that this process was going on for nearly four months. This however may not be remarkable in this case, though I have found nothing relating to the matter of quantity, in the records of cases which I have seen.

In relation to other tubes or ducts affected by this kind of inflammation, there is an interesting report made to our Pathological Society by Dr. Alonzo Clark, in 1845, particularly upon this point of quantity. The patient passed large quantities at different times, of organized fibrinous false membranes from the bowels. These discharges were preceded by colic pains referred to the upper part of the abdomen, inflammatory fever, lasting two or three days, all relieved by a discharge of a half a pint of substance, loaded with tubular casts of sizes, varying from a half-line to a half-inch in diameter; and from an inappreciable thickness, to that of half a line. Some were branched. He conjectured that those casts originated in the biliary and common ducts, as the result of plastic inflammation, thus accounting for the colic and fever preceding their discharge. The branched character of some of these casts, precluded the idea that they were formed in any portion of the intestines. At a later period he presented a quantity of fibrinous material, passed from the bowels at irregular intervals, by a person forty-five years of age, and remarked that she had done so for a long time, and that she seemed to have an inexhaustible manufactory of this material within her. It would add much to the interest of those cases, to know if any rheumatic diathesis existed in them. Was Dr. Clark's case of hepatic casts, with preceding fever and colic, an old rheumatic disease affecting this locality? He supposed that inflammation was excited by gall stones in the ducts. An interesting feature in my case, was the enlargement of the deep cervical and axillary glands, which first attracted notice many months before death, and excited suspicion of the malignant character of the case. These queries suggested themselves: First, Are these glands ever diseased to a marked degree, in the course of phthisis pulmonalis? Second, Are they always or generally thus diseased, in malignant disease, involving the bronchial lymphatics? The only record I have found, touching in the slightest way these queries, is that of a case presented to our Pathological Society in 1848, by a Dr. Foster (not stated which), of a lady eighty years of age, who a year and a half before, suffered cough, hæmoptysis, and extensive dullness over the left lung and summit of the right lung, absence of vesicular murmur, but had mucus rattle over the dull regions; had fever, and pulse as high as 130. Recovering from this, she suffered a similar attack several months later, excepting the hæmoptysis. From the time of this return, she was never free from cough, though not suspected to be serious in cause or character.



On the morning before the date of the report, a renewal of acute symptoms took place, and she died in twenty-four hours. With the first attack, the glands of both axillæ were swollen and tender, and as it passed off this swelling subsided, and did not return till about four months before death, when they again enlarged to the size of the fist on one side, and less on the other. At the autopsy, the left lung was found everywhere adherent, but otherwise healthy. There was much fluid in the posterior mediastinum, and in the right pleural cavity. In the posterior portion of the middle lobe of the right lung, was found a diseased mass, whose character was undetermined. The bronchial glands were much enlarged, and carbonaceous. The glands of the axillæ were much enlarged and softened. Though remarkable mostly for its imperfection, I adduce this history as the only one I have found in which the axillary glands and lungs were diseased simultaneously, from apparently the same cause, and that cause originally appearing in the latter organs. The query is often heard how so perfect casts of so large a number of air tubes can be coughed up, as they apparently must prevent any considerable amount of air from entering the tube behind them. Dr. Salter's theory was that the exuded material came mostly from the vesicles and ultimate bronchial tubes, and by pure mechanical force, perhaps peristaltic, is pushed out into the larger passages, moulding itself to their form and hardening as it advances. Upon this supposition we can easily conceive how these casts may at length, by their size and hardness, excite the violent cough whose successions may, sooner or later, detach them, and finally expel them.

If, then, plastic exudation from the fibro-cartilaginous tissues of the bronchi, even to their ultimate ramifications, may result from rheumatic inflammation, or from an inflammation excited by tubercular irritation; or from an inflammation excited by the presence and pressure of malignant deposit; or possibly aneurismal pressure, the therapeutical indications will depend, of course, upon the differential diagnosis made out in each case.



